NOAA Teachers at Sea
Vince Rosato and Kimberly Pratt
Onboard NOAA Ship RONALD H. BROWN
March 9 - 28, 2006

Log 3

Science Log #3
March 15, 2006
Location: East of Abaco Island

You may recall from the previous log that the package, or CTD, contains "mostly" a rosette of polyvinyl chloride (PVC)bottles that collect water samples on the way up from the sea floor. We have completed eight casts, which means we have dropped the package to the bottom eight times. On Cast # 4, on the way up, a piece of equipment on the package broke. On this Deep Western Boundary Current (DWBC) expedition scientists want to put as many devices on "the package" as possible. All of the measurements they are taking have some relationship to measuring the current, velocity, or flow of water masses. Flow in deep water is a little like a river in the ocean, but not like the one in the film, *Finding Nemo*. Some of the devices measure the same thing as other instruments do, and are redundant, or duplicated, in case some device fails on the unit. A secondary reason for redundancy is to check the precision of calculations to the thousandth or even ten-thousandth place (.002 or .0005). Other devices measure different things. For example, the altimeter measures distance to the bottom. It is important because a device lowered from the ship does not necessarily go straight down like a nut dropping off a tree, but moves with the rocking of the ship and shifting of the current in any direction. While the ship may show the ocean floor at say 5445 meters, the package may be over a sea mound—a big bump upward from the ocean floor—that registers 5300 meters. Do you see the necessity of having an altimeter to monitor of ocean depth? What the ship sees below may not be what the package has directly under it. Since it costs so much to send an expedition out, it makes sense to protect the instruments as well as to do as many measurements as possible in each cast.

Dr. Beale with "Cheesy Poofs."

In the center of the package is the biggest instrument of all, an acoustic current meter fondly nicknamed “Cheesy Poofs.” Look at the photo… can you see why it has that name? On Cast # 5 Cheesy Poofs went “POOF!” and broke. The ocean is a harsh environment for man-made instruments. They must be very strong because of the pressure, and very water-tight so they do not spring a leak. Poor Cheesy Poofs sprang a leak and didn’t work anymore. It measured the speed of the current, or, the “motion of the ocean,” as Dr. Lisa Beal said, the operator of the instrument. Luckily, Lisa had a spare instrument to replace Cheesy, so she and several technicians worked hard for three hours to remove one instrument and replace it with another. Just one acoustic current meter costs $50,000! So, “Cheesy Poofs” visited Davey Jones’ Locker, or the ocean depths. Observation and measurement are essential elements for scientific investigation.

Question of the Day: What sorts of measurements need to be very precise in your daily life at school or home, and what tools make those measurements?

Interview with Dr. Shari Yvon-Lewis Lead CFC Scientist.

Dr. Shari Yvon-Lewis

Shari, a true steward of the planet, is the lead CFC Scientist on cruise RB-06-03, aboard the RONALD H. BROWN. She studies Chlorofluorocarbons (CFCs) or more specifically, halocarbons, anything that has carbon and a halogen attached (one column left of inert gases on the Periodic Table). She hails from Chicopee, Massachusetts and grew up there. She received her undergraduate degree at the University of Massachusetts, Amherst and doctoral degree at the University of Miami. She wanted to use her chemistry not only in a laboratory but was inspired to apply it to natural systems. Her work on this voyage is all about determining the age of deep water. We are familiar with how the rings of a tree tell its age, and how the layers, or strata, of rock date the age of the earth. Tree rings are usually horizontal. Rock strata are thin horizontal layers that show age vertically. Rock layers are more like ocean layers, except ocean layers are fat. Ocean aging is found in the rising and sinking of warm and cold waters. Shari is studying when the deep water was last at the surface—the zero age reference. “Anything that is lower than the surface is older,” she explained. This is not to be confused with how old the oceans are, an entirely different question. Rather, if water sinks in one part of the ocean than it has to rise in another

place, otherwise the dynamics of the ocean would more closely be like a pond, and it is not a pond. Wind controls the surface currents or water on top of the ocean, and temperature and salt concentrations controls the deep-water circulation. The scientific name for deep-water circulation is ThermoHaline Circulation, THC, or Meridional Overturning Circulation, MOC. This particular cruise gives Shari one of the best places to study and prove or disprove that HydroChloroFluroCarbons (HCFCs) can be used as age indicators, or as viable tracers of water mass motion. If proven, these HCFCs, which are replacement refrigerants (what used to be Freon as in car air conditioning systems), propellants (like in aerosol spray cans) and foam blowing agents (like the material sprayed on ceilings), will help scientists understand the age of deep water from the time it was last at the surface.

What might a person studying such wonders enjoy in her recreational time? Shari likes to family golf, read Stephen King horror stories and other thrillers, and listen to Barry Manilow. She loves science and the mysteries of the earth. She would love to completely know the "feedback" between the ocean and climate change, as science continues to be a motivating force in her life. She encourages going to the beach and watching the tides ebb and flow, seeing the effect of the ocean and humbly realizing we are powerless against its force. Shari has judged science fairs from middles schools through graduate school and has mentored graduate students, who are students who after college graduation work on master's degrees. She has a graduate student, Julia O'Hern, working with her on this trip, who is sharing a cabin with mentor NOAA teacher, Kimberly Pratt. Shari concluded our discussion by telling me what 4th and 5th graders and everyone can do to get interested in oceanography: "Enjoy the ocean and take care of it," she said.

Personal log—Vince Rosato

Hello, everyone. I have been absorbing information from crew, scientists, civilians, and officers and been very busy during my shift helping scientists with getting samples and analyzing them. I'm learning with Kim ways to put this knowledge into practice in the classroom. Your email questions about the ship and the science, especially from your ocean books and logs, you're your tracking our journey are filling my days with variety. What is especially exciting to me is that misconception after misconception is being laid aside for truer models of what really is. For example, I never thought of surface flow of water being driven differently than deeper water currents. Another insight was about what seafaring life is really like and the type of teamwork, community, and cooperation it fosters. In fact, it supports Searles' "cooperation," as the character education virtue of the month. In participating in making measurements with so many specialized instruments, my uncle's statement, "With the right tool you can do any job," makes so much more sense.

I'd like to share something that I learned as a tribute for all future seafaring enthusiasts. Officers, crews, and sailors worldwide have rituals not only for proper decorum, as at watch change, but also to inspire cooperation, and lift the spirits for those who live at sea away from family for months at a time. One of the spirit-lifting rituals from maritime history was for those who were sailing over the equator for the first time. To "measure" the courage of the sailors, so to speak, each one had to endure a rite of passage that graduated them from "pollywog" to

"shellback." Crewmates waited with fear and trepidation about what the latest rite of passage would entail. Recently, the challenge was for everyone to participate in a talent show. Once you pass your "trial," you receive a card of graduation that you have to carry with you. If you are found without such documentation, you must endure the trial again! It is reported by maritime historians and confirmed by Chief Boatswain, Bruce Cowden, also an accomplished cartoonist, that wars were interrupted by this longtime tradition. He also mentioned that long ago, the shellback ritual was not so friendly.

Personal log—Kimberly Pratt

Hi all. It's been an interesting two days. First of all, I'm trying to get used twelve-hour working shifts. It's been difficult! Staying up late has been hard but it's getting easier. During my shift I've been helping collect water from casts, helping deploy the CTD, running "salts" which means putting water in an auto salinometer machine and testing it for conductivity. I've also been conducting interviews, talking with crew and trying to figure out what's been wrong with e-mails. Today, after not hearing from my family for over a week, the Chief Scientist, Dr. Molly, let me call home. Apparently my e-mails have been going out, but when people try to answer they are bounced back. Therefore, from now on use my AOL account, grnflea@aol.com, to contact me. That way I am sure to hear from you. The weather has been sunny, and yes, I did get sunburned yesterday. I also saw some flying fish and am always on the lookout for marine mammals. Now with the e-mail situation taken care of, I look forward to hearing from my students and continuing to share more of what we're learning from the sea!